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## Summary D2.3 Requirements of primary and secondary end-users

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Website [www.toiletforme.com](http://www.toiletforme.com)

### **Abstract**

This document is the summary of the public deliverable D2.3 "Requirements of primary and secondary end-users" of the Toilet4me2 (Study on supporting active living in (semi-) public environments by suitable toilets) project (short also "T4ME2") within Call 2019 of the AAL Programme. It is an integrated and co-produced document on the requirements and user scenarios, user stories from primary and secondary users. The full document can be found on [www.toiletforme.com](http://www.toiletforme.com).

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# Toilet4me2 – supporting active living in (semi-) public environments by suitable toilets

A consortium of European partners with different expertises cooperated to reach the goals of Toilet For Me Too.



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T4Me2 is funded in part by



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Toilet For Me Too: *Happily out of home thanks to a flexible and smart toilet.*

## 1 Introduction

One of the things that keeps people with a disability or elderly people from going out, is the lack of toilets that are publicly available and well accessible. The European AAL project Toilet For Me Too (T4ME2) wants to change this by developing a supportive ICT enhanced toilet adapting to the individual user needs, approachable and clean for use in semi-public space. With modern functions like stand-up support, adjustable height, a shower-WC, etc.

To come to an ideal Toilet For Me system, research among users of such toilets is needed. What are the needs of primary and secondary users?

## 2 Partners involved

The research is led by the two user partners Golden Days (NL) and Onsite Foundation (PL). User partner Sacred Heart (BE) and technical partner BEIA (RO) were involved as additional user partners and support was given by technical partner Sanmedi (NL). The project is coordinated by the Technical University of Vienna (AT).

Sacred Heart is a care group in Kortrijk, **Belgium**, that intends to meet the needs of elderly people and people with a higher need for support, and strives to empower them in their independence.

On Site Foundation is an NGO based in Warsaw, **Poland**. The goal of the foundation is to develop and strengthen local communities by creating liveable public spaces.

BEIA is an SME in Bucharest, **Romania**, it has implemented and integrated IoT telemetry applications in the field of smart city (noise, air quality, mobility) and e-health (tele-diagnosis of diabetes, emergency communication systems for patients, nurses, and doctors).

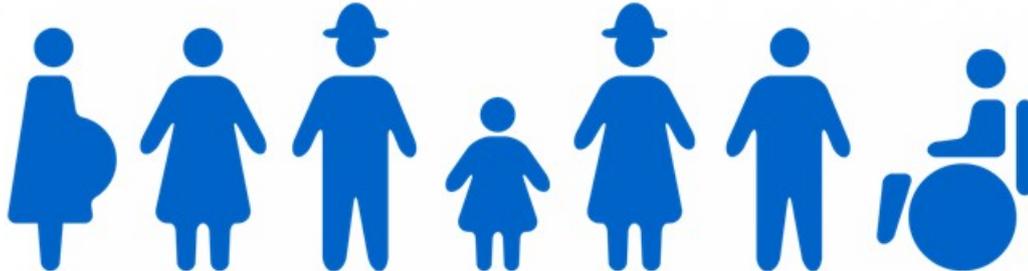
GD - Golden Days is a charity foundation for the elderly in the **Netherlands**. Their mission is to combat growing loneliness amongst the elderly and increase the independence and quality of life of frail elderly people.

Sanmedi bv is an SME in Uitgeest, the **Netherlands**, offering sanitary solutions for customers to live at home independently and allow for safety, hygiene, functionality and comfort for people with physical disabilities and/or elderly people.

TUW - TU Wien is the largest technical university of **Austria**. The T4ME2 project is affiliated with the highly interdisciplinary HCI unit at the Institute for Visual Computing and Human-centered Technology of TUW. TUW was also coordinating partner of the iToilet and Toilet4me projects.

### 3 Involved users

Primary users (elderly and people with disabilities) 61 in total and 39 secondary users (informal and formal caregivers) were involved in this research, **100 users** total. Additionally, **154 users** were involved in an online poll on accessible toilets outside home.



*Figure 1: Symbolised involved users*

#### 3.1 Primary users

- People of all ages who are limited in their ability to use a standard toilet independently (without assistance) due to physical limitations.
- Difficulty in transfer to/from the toilet (typically stand-up) and/or cleaning with paper (typically reaching back).
- Physical (mobility) challenges in general, e.g. wheelchair user, obesity, MS (multiple sclerosis), arthritis.
- People in post-operative situations for whom it currently is difficult or impossible to use a not adequately adapted toilet.

#### 3.2 Secondary users

- Are people caring for a primary user: this can be professionals and/or unpaid carers.

## 4 Research

Research is based on the finding from the Toilet4Me study project in 2018/2019 which clearly found a need for such advanced toilets (see <http://toilet4me-project.eu/>).

With these findings, we continued in the current project Toilet For Me Too and started with an awareness-raising phase where existing commercial sanitary products were used and tested by primary and secondary users in order to gauge needs and priorities. This group of target end-users consisting of potential users got hands-on experience to be able to actively contribute to the requirements collection.

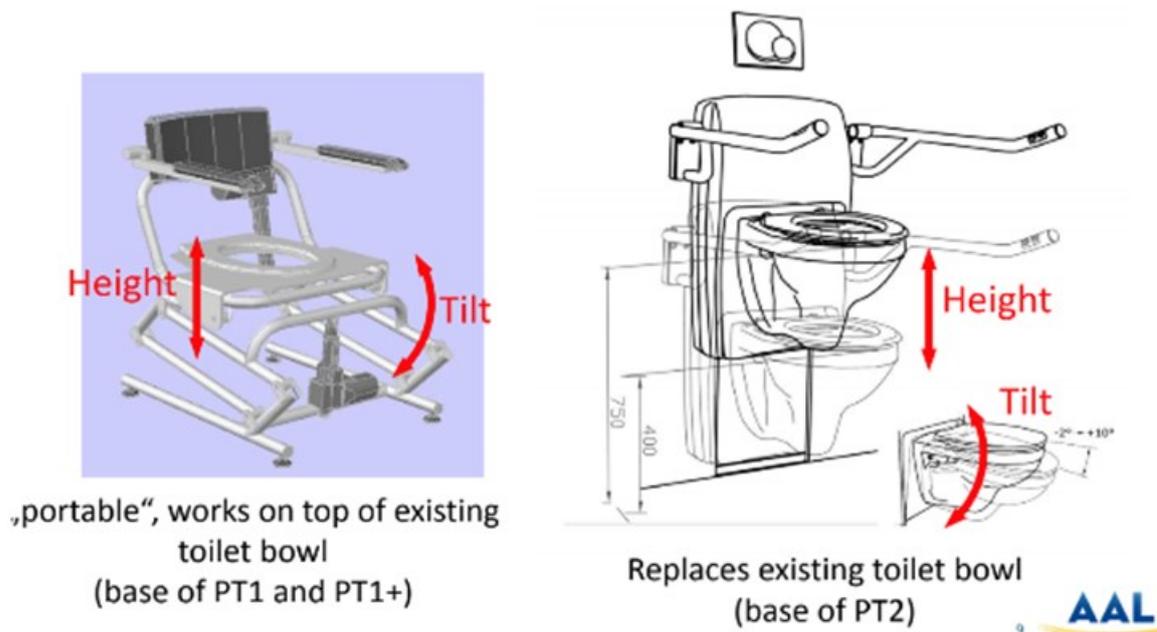


Figure 2: Impression of the two types of a Toilet For Me system. Source: T4ME project 2019. Users tested actual test toilets, they referred to their own supportive toilet or they were shown videos of a modern toilet.

A one-time survey (questionnaire) was used that could be completed on paper, online, or via a live interview by a researcher and a user on the test sites or by an interview by phone/video call.

In the awareness raising activities and interviews, users gave their opinions, remarks, suggestions for a Toilet For Me Too system. As extra activity an online poll was held in three countries: primary users who use publicly accessible toilets were asked to share their opinion on these toilets

Existing commercial sanitary products from the local market were used and tested by primary and secondary users at the user partners' test sites in Poland, The Netherlands, Belgium and Romania. Supportive toilets with a selection of modern functions like stand-up support, adjustable height, a shower-WC, etc. were tested.

The original work plan, methodological approach, and time schedule were modified and updated with alternatives, adaptations and safety measures in order to face the various challenges of the **Covid-19 pandemic**.



*Figure 3: The testing in Poland. GEBERIT AquaClean 8000 with an additional PW GAMA lift next to it (top left) and installed on the existing toilet (bottom left). Participants of the testing - a primary user during the interview with the OSF team member (top right) and caregiver visiting the restroom (bottom right).*

## 4.1 Most important results

### 4.1.1 Accessible toilets in public space

Research among our target group (154 respondents in total in 3 countries) in an online poll showed that the accessible public toilets/disabled public toilets are often used by primary users and their carers. However, there is a **lack of such toilets** in (semi-) public spaces like gas stations, restaurants, hotels, trains, libraries, shopping malls. The public toilets for the disabled are often **not clean** and have **insufficient functionalities**. Desired functionalities most mentioned in our online poll are a shower-WC, stand-up function (tilt seat), a changing table for adults, and vertical lift (height adjustment).

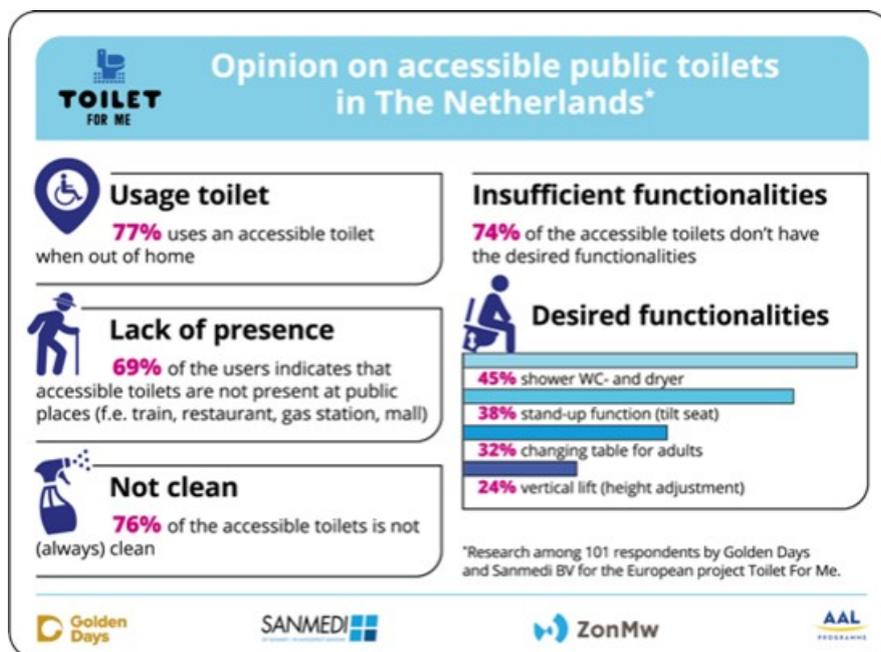


Figure 4: Opinion on accessible public toilets in The Netherlands

### 4.1.2 Functions of accessible toilets

The findings from the current research and from the previous study are in line regarding the essential or important functions for the envisaged new toilet system for semi-public use. The results of the tests with both user groups show that overall most of the selected requirements for this research are considered important.

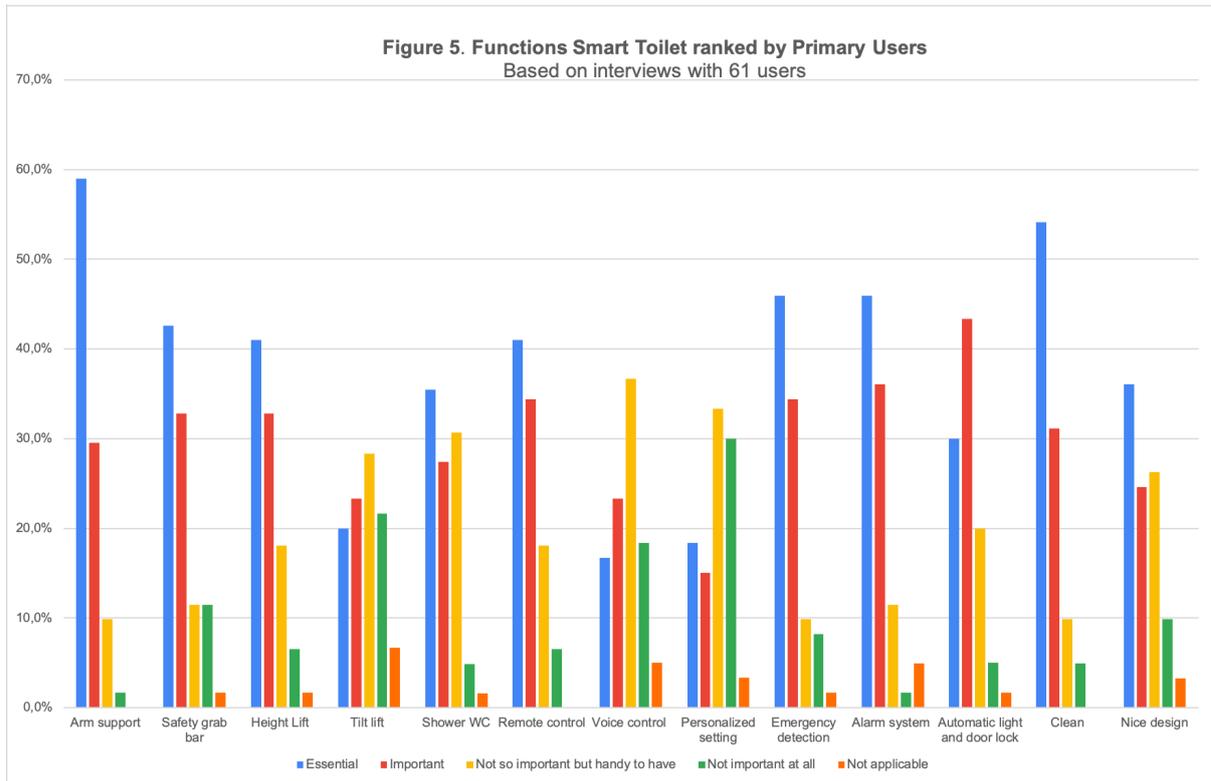


Figure 5: The functions ranked by primary users.

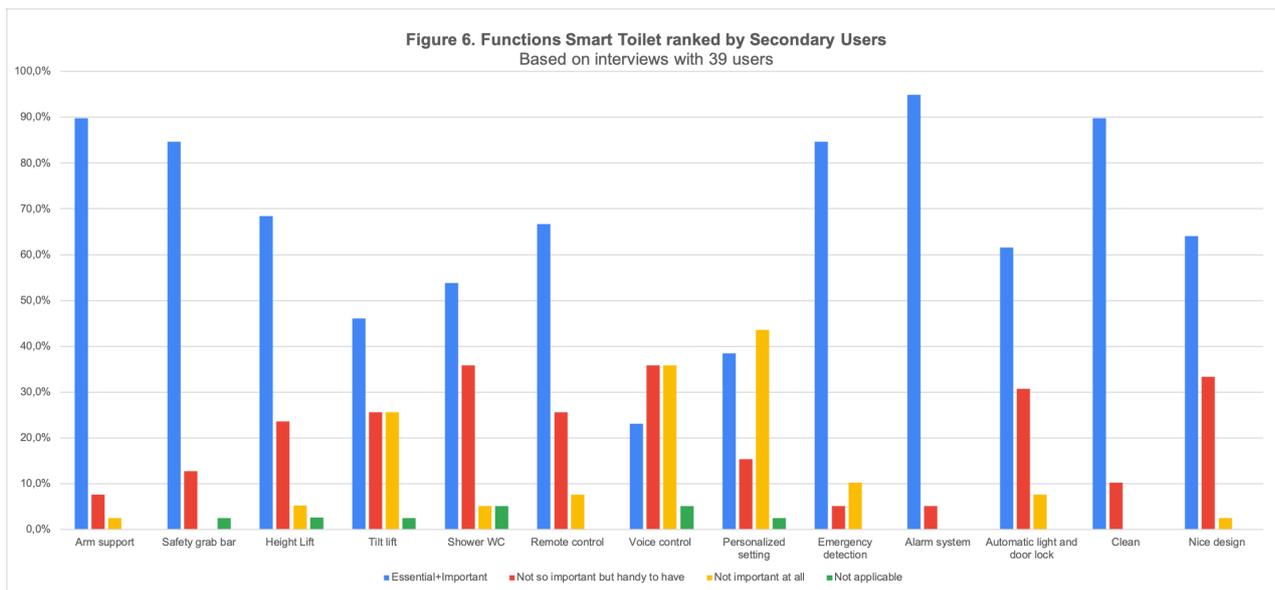


Figure 6: Functions ranked by secondary users.

The main intent of the first phase was to raise awareness. Generally, there is a need for more adapted toilet systems in the semi-public space. And currently, there is a lack of such toilets and if available they do not have the needed functions or are not as clean as needed. Also, the need for awareness raising is confirmed and the potential that more adaptable and more inclusive toilets will enable a larger part of the old population and/or people with disabilities to leave home for taking part in societal activities outside their own living area.

## 4.1.3 Top 5 general functions of accessible toilets

Functions ranked important or essential by <b>primary users</b> (61)		Functions ranked important or essential by <b>secondary users</b> (39)	
Type	%	Type	%
Arm Support	88.5	Alarm system	94.9
Alarm System	82.0	Arm support	89.7
Safety grab bar	75.4	Safety grab bars	84.6
Automatic light and door lock	73.3	Nice design	64.1
Nice design	60.7	Automatic light and door lock	61.5

## 4.1.4 Special functions (Toilet For Me System)

The results of the interviews with both user groups (primary and secondary end-users) show that overall most of the **modern requirements** such as Shower-WC, height lift, tilt lift for a Toilet For Me System are considered **important**. It can be concluded that for the design of the toilet system it is of paramount importance to offer an intuitive way of interaction between user and system.

**Primary users** consider the height lift important, however, they have concerns on the reliability of the height lift and suggest clear instructions. Most of the primary users would mostly use the Shower-WC again. However, there are some barriers to use this modern function and concerns such as hygiene, water pressure, and temperature.

84.6 % of the **secondary users** consider emergency detection essential or important and indispensable to ensure safety. They believe that the user's personal hygiene is increased by the Shower WC. Others believe that the height lift allows users to go to the toilet more independently, provided that there are clear instructions on how to use it.

Functions ranked important or essential by <b>primary users</b> (61)		Functions ranked important or essential by <b>secondary users</b> (39)	
Type	%	Type	%
Hygiene (Self-cleaning seat, Air quality, Autoflush)	85.2	Hygiene (Self-cleaning seat, Air quality, Autoflush)	89.7
Emergency detection	80.3	Emergency detection	84.6
Remote control	75.4	Height Lift	68.4
Height Lift	73.8	Remote control	66.7
Shower WC	62.9	Automatic doors	64.1
Tilt lift	43.3	Nice design	61.5
Voice control	40.0	Shower WC	53.8
Personalised settings	33.0	Tilt lift	46.2

### 4.1.5 Toilet room

Users (primary and secondary) also commented about toilet rooms in general, they missed adjustable mirror, trash bin, disinfection spray, hangers for clothes. All reachable. A non-slippery floor is often mentioned. The toilet room has to be spacious. The door has to be easy to open from both sides. A ceiling lift and a changing table for adults were mentioned by primary and secondary users. Other things that were missed: UV-C cleaner for disinfection of the entire room, automatic odour freshener, lights that stay on as long as the door is locked.

### 4.1.6 Technical suggestions

Technical suggestions are on robustness, maintenance should be easy, the toilet should be ergonomically, easy to find by the use of an app.

## 4.2 Advice for upcoming research

For the next project phase, it is planned to intensify co-design based on hands-on evaluation of first prototypes which already implement (part of) the proposed advanced functions.

### Advice:

- Overall: **Keep it simple**, the user needs to understand the different functions. Symbols are very important. They should speak for themselves.
- Offer a simple, clear manual/user guide for every function.
- Test whether users **understand** the different functions.
- WC Shower: people are not yet familiar with using this function, sometimes they are even scared. Thus, clear signs/symbols on how to use this function are essential.
- Test voice control for giving commands with both user groups so they become aware of the **possibilities**.
- Test personalized settings with both users groups where the smart toilet adjusts to your preferred setting: height, tilt,...
- Test the Smart 3D sensor/alarm call system with both user groups.
- Test the cleaning: Self-cleaning seat, air quality, auto-flush. Test how to **combine** all the cleaning activities.
- Test how all the different functions work together in an integrated system and an easy to understand user interface.
- Write an **advice for accessible toilets in general** based on all the suggestions we gathered on the room, the accessories. When installing a Toilet For Me system also those suggestions should be taken into account.

### 4.2.1 Primary users story

#### **Julan** (The Netherlands)

Julan, 76 years old, retired, lives independently in a small village in The Netherlands.

*"I use handles at the toilet, a toilet with a Shower-WC and a dryer function, the toilet has sensor for flushing, and a hoist that I can operate independently. There is also an extra sturdy toilet seat that cannot move when taking a seat. In practice, this means that **I can only use the toilet in my own home**. This means when I am out-of-home I have to be helped by someone with a lot of strength to be able to place me on the toilet, et cetera."*

The use of the toilet itself is often also problematic for example the door is often difficult to open and close, barely or impossible to lock or the light suddenly goes out.

*"I often cannot stand close to the toilet because of a trash can or something like that. It is also often too small or poorly laid out. If a Toilet For Me system would be available in The Netherlands and I can use it by myself, this means I can go to the places in the near proximity of this toilet. It means I don't have to ask family members or friends to accompany to the toilet. **It would bring me freedom.**"*

